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New and interesting *Laboulbeniales* from southern and southeastern Asia

D. Haelewaters[1]* & S. Yaakop[2]

[1]*Farlow Reference Library and Herbarium of Cryptogamic Botany, Harvard University 22 Divinity Avenue, Cambridge, Massachusetts 02138, U.S.A.*

[2]*Faculty of Science & Technology, School of Environmental and Natural Resource Sciences, Universiti Kebangsaan Malaysia, Bangi 43600, Malaysia*

* Correspondence to: *dhaelewaters@fas.harvard.edu*

Abstract — Two new species of *Laboulbenia* from the Philippines are described and illustrated: *Laboulbenia erotylidarum* on an erotylid beetle (*Coleoptera*, *Erotylidae*) and *Laboulbenia poplitea* on *Craspedophorus* sp. (*Coleoptera*, *Carabidae*). In addition, we present ten new records of *Laboulbeniales* from several countries in southern and southeastern Asia on coleopteran hosts. These are *Blasticomyces lispini* from Borneo (Indonesia), *Cantharomyces orientalis* from the Philippines, *Dimeromyces rugosus* on *Leiochrodes* sp. from Sumatra (Indonesia), *Laboulbenia anoplogenii* on *Clivina* sp. from India, *L. cafii* on *Remus corallicola* from Singapore, *L. satanas* from the Philippines, *L. timurensis* on *Clivina inopaca* from Papua New Guinea, *Monoicomyces stenusae* on *Silusa* sp. from the Philippines, *Ormomyces clivinae* on *Clivina* sp. from India, and *Peyritschiella princeps* on *Philonthus tardus* from Lombok (Indonesia).

Key words — *Ascomycota*, insect-associated fungi, morphology, museum collection study, Roland Thaxter, taxonomy

Introduction

One group of microscopic insect-associated parasitic fungi, the order *Laboulbeniales* (*Ascomycota, Pezizomycotina, Laboulbeniomycetes*), is perhaps the most intriguing and yet least studied of all entomogenous fungi. *Laboulbeniales* are obligate parasites on invertebrate hosts, which include insects (mainly beetles and flies), millipedes, and mites. About 80% of the *Laboulbeniales* described thus far are parasitic on the order *Coleoptera* (Weir & Blackwell 2005). With currently about 2,000 species in 140 genera (Rossi & Santamaría 2012), the total number of *Laboulbeniales* associated with arthropod hosts is estimated to be between 15,000 and 75,000 species (Weir &

Hammond 1997), most of which still need to be described from wet tropical regions (Haelewaters et al. 2014a).

This paper presents ten new records for different southern and southeastern Asian countries. Additionally, we report thalli in the genus *Laboulbenia* that did not fit any existing description and therefore represent two new species.

Materials & methods

Over 23,000 insect specimens in the collection of Invertebrate Zoology at the American Museum of Natural History (AMNH) were screened for the presence of entomopathogenic fungi using a Nikon SMZ-U stereomicroscope. Almost six percent of these insects were found infested with *Laboulbeniales* (Haelewaters unpublished). Although the vast majority of the entomological collection at AMNH is the result of samplings in North America, a few infected hosts from Asia were found. Individual thalli were removed from the host's integument with a Minuten Pin (BioQuip #1208SA) and embedded in Amann solution or PVA Mounting Medium (BioQuip #6371A). Cover slips were ringed with transparent nail varnish. All microscopic slides are deposited at the Farlow Herbarium, Harvard University (FH).

Additional fungal material was found in unidentified mountings from Roland Thaxter, whose complete collection is deposited at the Farlow Herbarium, Harvard University (FH).

Morphological analyses, measurements, and photographs were made using an Olympus BX40 light microscope with Olympus XC50 digital camera and MicroSuite Special Edition software 3.1 (Soft Imaging Solutions GmbH). Images were optimized (with Levels and Brightness/Contrast tools) and cropped in Adobe Photoshop CS Version 8.0 (San Jose, California).

Taxonomy

Blasticomyces lispini (Thaxt.) I.I. Tav., Mycol. Memoir 9: 155 (1985) Plate 1a

Specimen examined: **INDONESIA**, **Borneo**, Central Kalimantan Prov., Tanjung Puting National Park, on "staphylinid close to *Lispinus*" [sic] (*Staphylinidae*, *Osoriinae*), 1926, leg. Eric Mjöberg, *Thaxter 3571*, slide FH 00313486 (4 thalli collected from elytra).

Previous records: *On Nacaeus impressicollis* [as *Lispinus*] and various *Lispinus* sp. from Indonesia (Java), Taiwan, Sri Lanka, the Philippines, China, Malaysian Borneo, and the Solomon Islands (Thaxter 1915, 1931, Majewski & Sugiyama 1986).

Three species are included in *Blasticomyces* I.I. Tav. All three have been previously observed on the island of Borneo: *B. denigratus* T. Majewski & K. Sugiy. on *Lispinus coarcticollis* from Sabah (Malaysia), *B. fastigiatus* (Thaxt.) I.I. Tav. on *Cercyon* sp. from Sarawak (Malaysia), and *B. lispini* on *Lispinus* spp. from Sarawak and Sabah (Malaysia) (Thaxter 1931, Majewski & Sugiyama 1986). Our specimens undoubtedly represent *B. lispini*, based on (1) no blackening of the basal parts of the receptacle, (2) receptacle consisting of superposed, flattened cells, usually undivided (a few cells may be divided by two vertical septa), and (3) a subconical and rather short perithecium. One

Plate 1. A. ***Blasticomyces lispini*** (FH 00313486). B. ***Cantharomyces orientalis*** (FH 00313465). C. ***Laboulbenia anoplogenii*** (FH 00313461). Scale bars = 50 μm.

studied thallus differs from the original description of *B. lispini* in displaying shallow blackening of the outer margins of receptacle basal cells 2–4.

Some *Lispinus* species have been transferred to *Nacaeus*. *Nacaeus* (*Lispinus*) *impressicollis* is a cosmopolitan species; it is broadly distributed in Australia, Japan (Naomi 1997), Central and South America, many Caribbean islands, Atlantic islands, and the Indo-Pacific biogeographic region (Irmler 2003).

Cantharomyces orientalis Speg., Anales Mus. Nac. Hist. Nat. Buenos Aires 27: 43 (1915) Plate 1b

Specimens examined: **THE PHILIPPINES**, **Luzon Island**, Metropolitan Manila, Manila, on "aleocharid" [sic] (*Staphylinidae*, *Aleocharinae*), Dec 1911, no collector, Thaxter 2421, slide FH 00313465 (2 thalli).

Previous records: On *Carpelimus* (syn. *Trogophloeus*) and related genera (*Staphylinidae*, *Oxytelinae*); two records were collected from *Bledius* (*Staphylinidae*, *Oxytelinae*). *Cantharomyces orientalis* is reported from Finland, Russia (Huldén 1983), Germany (Scheloske 1969), Italy (Spegazzini 1915), Poland (Siemaszko & Siemaszko 1928, 1932, Majewski 1994), the Netherlands [as *C. thaxteri*] (Middelhoek 1949), Spain (Santamaría 1989), Sweden, Switzerland (Huldén 1985), Belgium (De Kesel & Haghebaert 1991), Great Britain (Weir & Beakes 1993), Greece (Castaldo et al. 2004), Czech Republic, Slovakia (Rossi et al. 2010), and Algeria [as *C. abbreviatus*] (Maire 1920).

All 29 *Cantharomyces* species are characterized by a receptacle consisting of three superposed cells and a compound antheridium subtending a simple or variably branched primary appendage, and a perithecium having four to five

cells in each vertical row of outer wall cells (Haelewaters & De Kesel 2013). Hosts are mainly *Staphylinidae* (subfamily *Oxytelinae*, tribes *Bledíini*, *Euphaniini*, and *Oxyteliini*; subfamily *Aleocharinae*, tribes *Aleocharini*, and *Oxypodini*), next to *Dryopidae*, *Limnichidae*, and *Hydrophilidae*.

Cantharomyces orientalis is a very variable species, leading to confusion among all *Cantharomyces* species occurring on *Carpelimus* s.l. (see Santamaría 2003). The Philippine thalli have the primary appendage broken above the suprabasal cell (see Majewski 1990) but otherwise correspond to the description for *C. orientalis* with cell I hyaline and contrasting with the yellowish amber toned cells II (isodiametric to trapezoidal) and III (subequal to cell II but less high), the squarish basal cell of the primary appendage with the lateral antheridium, cell VI hyaline and elongated (≤40 µm), and the perithecium 68 × 37 µm, symmetrical, and broadest near basal third.

The Philippine finding of *C. orientalis* represents the first record of this species for Asia.

Dimeromyces rugosus Thaxt., Proc. Amer. Acad. Arts 55: 245 (1920) Plate 3a

Specimens examined: **INDONESIA**, **Sumatra**, West Sumatra Prov., Mount Singgalang, on *Leiochrodes* sp. (*Tenebrionidae*, *Diaperinae*), Nov-Dec 1925, leg. Edward Jacobson, Thaxter 3466, slide FH 00313485 (4 male + 4 female thalli from the legs).

Previous records: Known from material mentioned in the original description (Thaxter 1920), on *Leiochrodes medianus* from the Solomon Islands and on *L. minutus* from Malaysian Borneo. Afterwards recorded only in Taiwan, on *Leiochrodes* spp. (Terada 1976).

Dimeromyces Thaxt. is a large genus with 109 species (Kirk et al. 2008), parasitizing *Acarini*, *Blattodea*, *Dermaptera*, *Thysanoptera*, *Coleoptera*, and *Diptera* (Santamaría 2003). Its perithecial wall showing conspicuous transverse striae above the hyaline base easily distinguishes *D. rugosus* from other species. In addition, two tiny papillae are borne on opposite sides of the perithecial apex.

Laboulbenia anoplogenii Thaxt., Proc. Amer. Acad. Arts 35: 156 (1899) Plate 1c

= *Laboulbenia stenolophi* Speg., Redia 10: 65 (1914)

Specimens examined: **INDIA**, **West Bengal State**, Kanchrapara, on *Clivina* sp. (*Carabidae*, *Scaritinae*), 5 Aug 1944, leg. Mont A. Cazier, D. Haelew. 305, in coll. American Museum of Natural History, slides FH 00313459 (4 thalli from right elytron), FH 00313460 (1 thallus from right metatrochanter), FH 00313461 (3 thalli from left mesocoxa + mesotrochanter), FH 00313462 (2 thalli from right elytron), and FH 00313463 (1 thallus from right mesofemur).

Previous records: Described from *Anoplogenius cyanescens* [as *A. circumcinctus*] (*Carabidae*, *Harpalinae*). In Asia, beetles in *Abacetus*, *Chlaeminus* (*Carabidae*, *Pterostichinae*), *Egadroma*, *Harpalus*, *Platynus* [as *Colpodes* in Juan & Chien 1995], and *Stenolophus* (*Carabidae*, *Harpalinae*) are known to host this parasite (Santamaría

et al. 1991, Lee et al. 2002, Shen et al. 2006). Despite some confusion (see below), *L. anoplogenii* has a global distribution but has not yet been reported from South America (Santamaría et al. 1991).

Laboulbenia anoplogenii has been reported from India only once, from *Bembidion* (*Carabidae*, *Trechinae*) (Kaur et al. 1993). The same authors also report *L. stenolophi* Speg. and *L. egens* Speg. [misidentified as *L. tachyis* Thaxt.] from *Bembidion*, thereby adding the latter as a new host genus for all three parasite species. However, we suggest that this material should be re-examined.

Santamaría (1989, 1998) considers *Laboulbenia stenolophi* a synonym of *L. anoplogenii*. Other authors discriminate two species based on morphological characters (e.g., Terada 2001, Terada et al. 2004). Terada (2001) maintains that *Anoplogenius* is the only host genus for *L. anoplogenii*, and that previous records of *L. anoplogenii* from other hosts represent misidentifications. However, we observed subdivisions of cell IV, supposedly characteristic for *L. anoplogenii* on *Anoplogenius* (sensu Terada 2001) on three Roland Thaxter slides — from *Abacetus* spp.: FH 00313469 (from Sri Lanka) and FH 00313470 (from the Bengal region) and from *Stenolophus* sp.: FH 00313471 (from Massachusetts, USA). Thaxter's slide FH 00313468 (from *Stenolophus* sp. collected in Nantes, France) shows two mature thalli without transverse septa dividing cell IV. We share Santamaría's (1989, 1998) opinion that *L. anoplogenii* and *L. stenolophi* are synonyms, taking into account some degree of variability of the subdivisions of cell IV.

The species-rich genus *Clivina* is known as a host to several species of *Laboulbeniales*: *Dixomyces clivinae* (Thaxt.) I.I. Tav., *D. pallescens* (Thaxt.) I.I. Tav., *Laboulbenia clivinalis* Thaxt., *L. schizogenii* Thaxt., *L. timurensis* T. Majewski & K. Sugiy., *Ormomyces clivinae*, and *Peyritschiella clivinae* Thaxt. *Clivina* may also be an accidental host for *L. anoplogenii* ("nebenwirt"; Scheloske 1969), since it occupies the same habitat as the parasite's typical hosts (Santamaría 1998). The first record of *L. anoplogenii* on *Clivina*, an obvious consequence of an accidental infection (S. Santamaría pers. comm.), was found in the Natural Park of El Fondo, Spain, on a single specimen of *C. ypsilon* (Balazuc et al. 1983, Santamaría 1989).

Laboulbenia cafii Thaxt., Proc. Amer. Acad. Arts 35: 162 (1899)

New record: **SINGAPORE**, **East Region**, Changi, on *Remus corallicola* (*Staphylinidae*, *Staphylininae*), no date, leg. Malcolm Cameron, D. Haelew. 303, in coll. American Museum of Natural History, slide FH 00313440 (1 thallus collected from left metafemur).

Previous records: *Laboulbenia cafii* is known from America, Europe, Asia, and Oceania (Santamaría 1998). In Asia, it has been reported from Hong Kong (Thaxter 1908), India (Balazuc collection, in Santamaría et al. 1991), and Japan (Sugiyama 1973). Hosts are species belonging to the genus *Cafius* and related genera.

Laboulbenia erotylidarum Haelew., **sp. nov.** PLATE 2A,B

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Differs from all other *Laboulbenia* species on *Erotylidae* by its blackening of the basal outermost part of the outer appendage and the posterior margin of the perithecium immersed in the receptacle for about 3/4 of its length.

Type: The Philippines, Mindanao Island, Zamboanga Peninsula administrative region, on "erotylid" [sic] (family *Erotylidae*), no date, no collector, Thaxter 3051 (**Holotype**, FH 00313483 (slide, 1 mature thallus); **isotype**, FH 00313484 (slide, 1 mature thallus collected from the elytron)).

Etymology: Named after the host family.

Thallus 212–265 µm long from foot to perithecial tip, pale greyish-brown in color with only the distal 3/4 of cell I and perithecium darker. Cells I, II, III, and IV of similar length, 2–2.5× longer than broad. Cell II with subparallel margins. Cell V wedge-shaped, slightly protruding between the perithecium and the insertion cell; located in the inner-upper corner of cell IV, which is about twice as long as cell V. Septum IV–V oblique, strongly curved. Insertion cell oblique, very dark, marking a strong constriction on both sides above cells IV and V, located at the distal quarter of the perithecium but separated from it. Outer appendage consisting of up to four hyaline branches of gradually more elongate cells, resulting from up to two successive dichotomies, the first of which occurring above the large, irregular basal cell; the basal cells, the outermost suprabasal, and the following cells of the outermost branch are externally blackened. Inner appendage consisting of a basal cell that is broader than long, carrying two suprabasal cells, the inner of which gives rise to a single branch, the outer one rounded, large, giving rise to two simple branches; all branches composed of gradually more elongate cells. Antheridia not observed. Longest outer appendage 205 µm, longest inner appendage 220 µm. Cell VI trapezoidal, 1.5× longer than broad. Perithecium 111–118 × 38–42 µm, fusiform, hardly inflated; the apex asymmetrical, with very prominent and rounded posterior lips, each of which bearing a conspicuous, rounded papilla; pre-ostiolar spots black, sub-opaque, both more or less merging by a pre-apical shading; the ostiole hyaline. Ascospores 64–72 × 4.7–5.6 µm.

Six species of *Laboulbenia* are previously reported from *Erotylidae*: *L. parvula* Thaxt. (but see discussion below); *L. scaphidomorphi* Speg. on *Scaphidomorphus bosci* from Panama (type), Bolivia, Brazil, Ecuador, Paraguay, and Peru (Spegazzini 1915, Barragán et al. 2013); *L. nesitidis* Balazuc on *Nesitis sexnotata* from Peninsular Malaysia (Balazuc 1975); *L. encaustis* K. Sugiy. & T. Majewski on *Encaustis praenobilis* from Ecuador (Sugiyama & Majewski 1987); *L. skelleyi* W. Rossi & Bergonzo on *Pselaphacus* spp. from Brazil, Costa Rica, and Ecuador (Rossi & Bergonzo 2008; Barragán et al. 2013); and *L. mycotreti* W. Rossi on *Mycotretus* spp. from Ecuador (Rossi 2011).

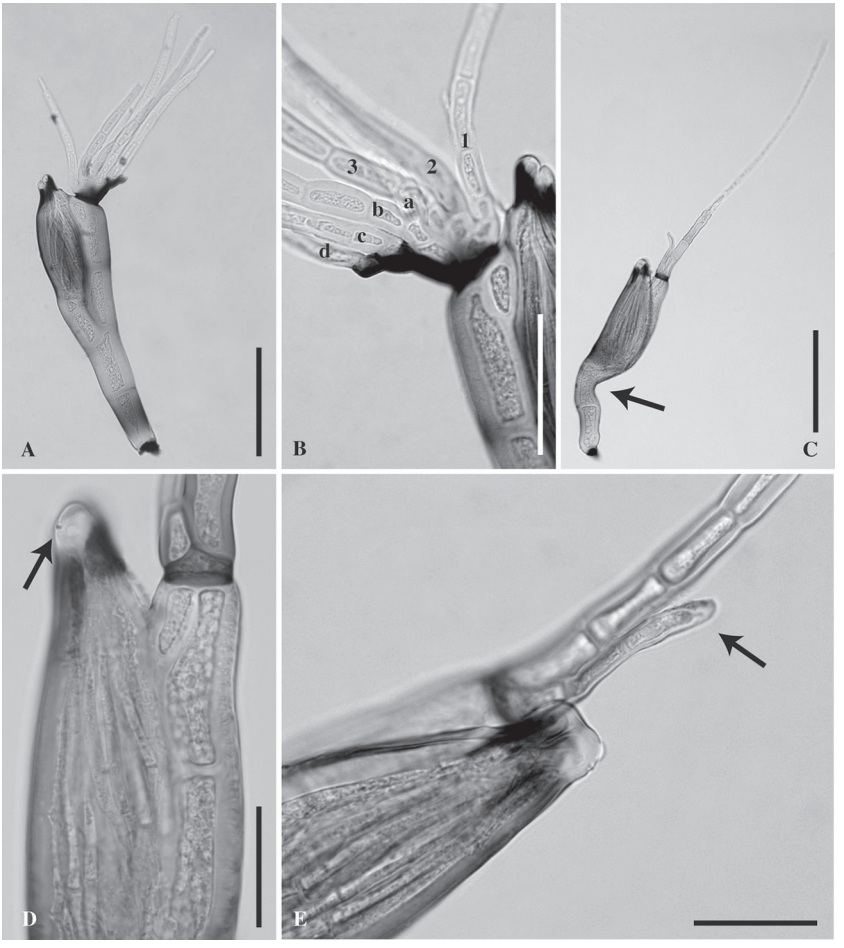

Plate 2. ***Laboulbenia erotylidarum.*** A. Habitus (isotype, FH 00313484). B. Detail of inner appendage with three (1–3) branches and outer appendage with four (a–d) branches (holotype, FH 00313483). ***Laboulbenia poplitea.*** C. Habitus, with the outer appendage more than doubling the full thallus length (holotype, FH 00313480). D. Detail of the perithecial apex, with the focus on one papilla (arrow). E. Detail of the single antheridium (arrow) (isotype, FH 00313481). Scale bars: A, C = 100 μm; B = 50 μm; D, E = 25 μm.

Unlike *L. erotylidarum,* both *L. scaphidomorphi* and *L. encaustis* have the insertion cell joined to the posterior margin of the perithecium (Spegazzini 1915, Sugiyama & Majewski 1987). *Laboulbenia mycotreti* differs from the new species by its stout habitus, the unbranched outer and inner appendages, and the exceptional position of cell VI (Rossi 2011).

Laboulbenia erotylidarum, *L. nesitidis*, and *L. skelleyi* share having cell V protrude between the perithecium and the insertion cell. *Laboulbenia skelleyi*, however, differs in its unbranched outer appendage, a bifurcate inner appendage, and a much shorter and stouter general appearance (Rossi & Bergonzo 2008). *Laboulbenia nesitidis* is distinguished by a perithecium that is free for more than half of its length, a different branching pattern, and a different pigmentation of the appendages (Balazuc 1975).

Colla (1926) reported *L. parvula* also from *Erotylidae* but provided no description or illustration. We agree with Rossi & Bergonzo (2008) that the record of *L. parvula* on *Brachysphaenus bimaculatus* (Colla 1926) is doubtful. This parasite was described and is known from *Carabidae* (subfamilies *Harpalinae* and *Trechinae*). *Laboulbenia parvula* obviously differs from *L. erotylidarum* in its largely free perithecium, a cell VI that is broader than long, and the differently structured appendages, the outermost with more or less darkened lower cells (mainly at their posterior margins).

We retain the species name written on the slide labels by Roland Thaxter.

Laboulbenia poplitea Haelew., **sp. nov.** PLATE 2C–E

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Differs from other *Laboulbenia* species by its kinked cell II posterior margin, its perithecium covering most of cell III, and cells III and IV posterior margins parallel to the perithecial anterior margin.

TYPE: The Philippines, Luzon Island, Metropolitan Manila, Manila, on *Craspedophorus* sp. (*Carabidae*, *Harpalinae*, *Panagaeini*), Jan 1912, no collector, Thaxter 2549 (**Holotype**, FH 00313480 (slide, 4 mature thalli; **isotype**, FH 00313481 (slide, 3 mature thalli)).

ETYMOLOGY: From the Latin noun *popliteus* = back of the knee joint, referring to the angulated posterior margin of cell II.

THALLUS 195–212 µm long from foot to perithecial tip, light brown in color with darker cell VI and perithecium. CELLS I and II forming a pedicel; the former rectangular, 44 × 20 µm; the latter abruptly broadening upwards, distally up to 41 µm wide, its posterior margin kinked and longer (38–52 µm) than the (straight) anterior margin (30–44 µm). CELL III rectangular, 47–56 µm long, hardly to distinguish from the body of the perithecium. CELL V wedge-shaped, distal half separated from perithecial wall, located in inner-upper corner of CELL IV, which is elongated, 39–44 µm long, on average 2.4× longer than cell V. INSERTION CELL dark and thick, marking a constriction above cells IV and V, located at height of preostiolar spots of perithecium, but separated from it. OUTER APPENDAGE simple, long and slender, up to 320 µm in length, consisting of a rectangular basal cell of about 19 µm long, followed by one to three cells of similar length; the other cells forming the appendage more elongate. INNER APPENDAGE consisting of a small, subtriangular basal cell, reaching only 2/3 of the length of the basal cell of the outer appendage and bearing distally one

elongate cell that produces a slender antheridium. With age, the antheridium degenerates and elongates as a simple evanescent branch. Cell VI broader than long, wedge-shaped, its anterior side measuring 14–17 µm. Perithecium 95–106 × 37–42 µm, asymmetrical, the anterior margin nearly straight, the posterior margin strongly convex, broadest at 1/3, tapering upwards; the apex asymmetrical, ending in three rounded lips, the anterior being distinctly shorter; papillae conspicuous on anterior and posterior lips; the ostiole hyaline, very contrasting to the pre-ostiolar spots, the anterior of which is more reduced to a longitudinal stria. Ascospores 51–63 × 3.2–4.7 µm.

Laboulbenia poplitea is recognized by the following characteristics: 1) the kinked posterior margin of cell II, giving it the look of the back of the knee joint, 2) cell III covered by the body of the perithecium, and 3) the posterior margins of cells III and IV parallel to the anterior perithecial margin. In addition, the outer appendage is unbranched and can become very long, contributing to a total thallus length (from foot to tip of the outer appendage) up to 0.5 mm. In many *Laboulbenia* species damaged appendages are known to regenerate atypically. Yet, among all examined specimens of *L. poplitea*, we found no thalli with abnormal regeneration; two thalli with a normally regenerated — unbranched — outer appendage were observed.

Laboulbenia poplitea bears a superficial resemblance to *L. erecta* Thaxt., parasitic on *Platynus* spp. [as *Colpodes*] (*Carabidae*, *Harpalinae*, *Platynini*) from Mexico, which, however, has a straight cell II, an inner appendage with the suprabasal cell producing two antheridia, and an outer appendage always branched above the suprabasal cell and with sometimes an additional branch arising from the basal cell anterior side (Thaxter 1899, Haelewaters, pers. obs.). In addition and in contrast to *L. poplitea*, the perithecium of *L. erecta* does not cover cell III but has an almost symmetrical profile.

Craspedophorus is a senior synonym of *Brachyonychus*, which Roland Thaxter wrote [misspelled as "*Brachionychus*"] on the slide labels. *Craspedophorus,* an Old World genus, is very speciose. Only three species of *Laboulbeniales* have been reported on this host genus: *Laboulbenia brachyonychi* Thaxt., *L. proliferans* Thaxt., and *L. taiwaniana* Terada et al.

Laboulbenia proliferans parasitizes carabid beetles representing several subfamilies and tribes (e.g., *Brachinini*, *Licinini*, *Callistini*, *Panagaeini*) from Europe, Asia, Africa, and Oceania (Arndt & Santamaría 2004) but differs from *L. poplitea* in many respects, e.g. by the proliferation of cell V (Thaxter 1893). Also *L. brachyonychi* (Thaxter 1899) is very different morphologically, with a wholly free slender perithecium, the androstichum (cells III, IV, and V) forming a dark pigmented stalk separated from the perithecium, and both the outer and inner appendage simple and elongate (the inner one may be branched

Plate 3. A. ***Dimeromyces rugosus*** (FH 00313485), mature male thallus (m) and female thallus (f), showing transverse striae at the perithecial wall (area between dashed lines) and two papillae at opposite sides of the perithecial apex (arrow). B. ***Monoicomyces stenusae*** (FH 2535). C. ***Laboulbenia satanas*** (FH 00313478). D. ***Laboulbenia timurensis***, arrow showing the non-pigmented, lens-shaped insertion cell, above which occur subdivisions of the appendage basal cells (FH 00313449). E. ***Ormomyces clivinae***, showing ascospores oozing out of the perithecium two by two (FH 00313445). Scale bars: A = 50 μm; B–E = 100 μm.

one or twice). More recently, Terada et al. (2008) described *L. taiwaniana* on *Craspedophorus formosanus* from Taiwan, which is distinguished by the black septum between the basal and suprabasal cell of the inner appendage, next to the elongate perithecium and cell V subequal in length to cell IV.

Laboulbenia satanas Balazuc, Rev. Mycol. 37: 261 (1973) PLATE 3C

SPECIMENS EXAMINED: **THE PHILIPPINES**, **LUZON ISLAND**, LAGUNA PROV., Mount Makiling, on "gyrinid beetle" (*Gyrinidae*), no date, leg. Charles F. Baker, Thaxter 3244, slides FH 00313475 (12 thalli), FH 00313476 (4 thalli), FH 00313477 (26 thalli), FH 00313478 (11 thalli), and FH 00313479 (14 thalli).

PREVIOUS RECORD: The only previous report is from the Philippines (Balazuc 1973), on *Orectochilus discus* (*Gyrinidae*).

Some new *Laboulbenia* species that Thaxter intended to characterize in the never-finished sixth volume of his monumental monograph have now been described by other scientists (Haelewaters & Rossi 2014). *Laboulbenia satanas* parasitizing *Gyrinidae* is one. Thaxter had provisionally named "his" new species *L.* "*auriculata,*" but Balazuc (1973) formally described the same species as *L. satanas*.

The combination of cell V forming an elongated lobe along the posterior margin of the perithecium and the horn-like outgrowths at the perithecial apex is unlike any other species in the genus. *Laboulbenia bicornis* Thaxt. shares the slender (olive-)brown horn-like processes, yet these processes are differently shaped in both species (see Thaxter 1908, Plate LXVII, Figs. 1–2). In addition, *L. bicornis* is much more slender and elongated (780–950 µm) than *L. satanas* (250–390 µm). *Laboulbenia fallax* Thaxt. (on *Gyretes* spp.) and *L. rotundata* Thaxt. (on *Dineutes spinosus*) also parasitize members of the *Gyrinidae*. Both species share with *L. satanas* the unusual development of cell V, but lack any differentiation at the perithecial tip (except for two minute tooth-like projections in *L. rotundata*).

Laboulbenia timurensis T. Majewski & K. Sugiy., Trans. Mycol. Soc. Japan 27: 436 (1987) PLATE 3D

SPECIMENS EXAMINED: **PAPUA NEW GUINEA**, **MILNE BAY PROV.**, Modeway Bay, on *Clivina inopaca* (*Carabidae*, *Scaritinae*), 2 Feb 1956, leg. Leonard J. Brass, det. Philip J. Darlington, D. Haelew. 308, in coll. American Museum of Natural History, slides FH 00313447 (4 thalli from left elytron), FH 00313448 (1 thallus from right mesotibia), FH 00313449 (3 thalli from left metatibia), FH 00313450 (6 thalli from legs), FH 00313451 (1 thallus from left mesotibia), FH 00313452 (2 thalli from right elytron), and FH 00313453 (4 thalli from right elytron).

PREVIOUS RECORDS: Described on *Clivina* sp. (*epippiata* group) from Indonesia (Borneo); afterwards recorded only once, on *Clivina yanoi* from Taiwan (Majewski & Sugiyama 1986, Terada et al. 2004).

The studied thalli correspond morphologically with the figures of *L. timurensis* in Terada et al. (2004). We agree with their suggestion that "the division [into a mass of small cells] seems to be in the appendage above the insertion cell," which is undivided and lens-shaped. The parasites were found on both the legs and elytra of the host.

Monoicomyces stenusae Thaxt., Proc. Amer. Acad. Arts 51: 30 (1915) PLATE 3B

EXAMINED SPECIMEN: **THE PHILIPPINES**, **LUZON ISLAND,** METROPOLITAN MANILA, Manila, on *Silusa* sp. (*Carabidae*, *Scaritinae*), Dec 1911, no collector, Thaxter 2417, slide FH 00313466 (1 thallus collected from the elytron).

PREVIOUS RECORDS: Described from *Neosilusa ceylonica* [as *Stenusa* in Thaxter 1915; as *Silusa* in Thaxter 1931] (*Staphylinidae*, *Aleocharinae*) from Indonesia (Java). Afterwards reported only once, on "*Silusa kamerunensis*" from Cameroon (Thaxter 1915, 1931).

Majewski (1988) found *Monoicomyces plagiusae* Thaxt. in Japan and suggested that *M. plagiusae* and *M. stenusae* are synonyms. Before Majewski (1988), *Monoicomyces plagiusae* was known only from the type locality in Indonesia (Sumatra) (Thaxter 1931).

A single thallus mounted by Thaxter was studied. The available specimen corresponds most to the description for *Monoicomyces stenusae*. The two secondary axes on either side of the suprabasal cell are proliferated, consisting of three cells, the latter of which gives rise to two antheridia and a perithecium. Thaxter's (1915) original description mentions that the third cell is "usually terminated by two antheridia." Also, our measurements differ significantly from Thaxter's measurements of thalli from Java (Indonesia) and Cameroon; especially the cells VI (up to 114 × 32 μm) and the perithecia (144–156 × 41–47 μm) are considerably larger than reported by Thaxter himself.

Considering Thaxter's (1915, 1931) suggestion of prominent morphological variation within this species, we think it is safe to identify the Philippine thallus as *M. stenusae*, until more material becomes available. Moreover, this thallus might represent another form, restricted to the elytra, whereas Thaxter (1915, 1931) mentions only smaller, compact forms taken from the legs and "more developed" ones from the abdomen.

Ormomyces clivinae (Thaxt.) I.I. Tav., Mycol. Memoir 9: 266 (1985) PLATE 3E

NEW RECORD FROM INDIA: **INDIA**, **WEST BENGAL STATE**, Kanchrapara, on *Clivina* sp. (*Carabidae*, *Scaritinae*), 9 Jul 1944, leg. Mont A. Cazier, D. Haelew. 306, in coll. American Museum of Natural History, slides FH 00313443 (2 thalli from right elytron), FH 00313444 (2 thalli from distal tip abdomen), and FH 00313445 (4 thalli from right elytron).

PREVIOUS RECORDS: Recorded on *Clivina* spp. from Indonesia (type), Madagascar, Sierra Leone, and Cameroon (Balazuc 1982, Rossi 1982, Tavares 1985).

Ormomyces I.I. Tav. was erected to accommodate a single species, *O. clivinae*, which Thaxter (1915) had earlier placed in *Misgomyces.* The species is related to *Ecteinomyces trichopterophilus* Thaxt., which shares the uniseriate receptacle. However, *E. trichopterophilus* differs from *O. clivinae* in its cell III having a corner cell (which may give rise to a secondary branch), a perithecium with long

narrow neck, and in having different hosts (*Ptiliidae*, *Acrotrichinae*: *Acrotrichis* spp., *Baeocrara variolosa*) (Tavares 1985, Haelewaters et al. 2014b). Notable is that *E. trichopterophilus* has been collected in North and South America and Europe (Haelewaters et al. 2014b), while *O. clivinae* has so far been recorded only in southeastern Asia and Africa. Future collections will elucidate whether or not the geographical distributions of the two species overlap.

A thorough literature review of all *Laboulbeniales* reported from India yielded only 32 species (Thaxter 1896, 1899, 1900, 1901, 1902, 1908, 1915, 1926; Batra 1963; Kaur et al. 1993; Kaur & Mukerji 1995, 1996a,b; Pathak & Mukerji 1997; present paper). However, since India is considered one of the 17 "megadiverse" countries in the world, with the Western Ghats mountain range recognized as a biodiversity hotspot (Myers et al. 2000), we anticipate that many more species of *Laboulbeniales* will be found in this country.

Peyritschiella princeps (Thaxt.) I.I. Tav., Mycol. Memoir 9: 270 (1985)

Specimens examined: **INDONESIA**, **Lombok**, West Nusa Tenggara Prov., Sapit village, on *Philonthus tardus* (*Staphylinidae*, *Staphylininae*), Apr 1896, leg. Hans Fruhstorfer, D. Haelew. 304, in coll. American Museum of Natural History, slides FH 00313441 (1 thallus from pronotum) and FH 00313442 (1 thallus from left-hand side tergite).

Previous records: Described as *Dichomyces princeps* on *Philonthus sordidus* (*Staphylinidae*, *Staphylininae*), Massachusetts, U.S.A. *Peyritschiella princeps* is known from all continents except Antarctica, attacking beetles in the genera *Quediomacrus*, *Spatulonthus*, and *Philonthus* (Santamaría et al. 1991).

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